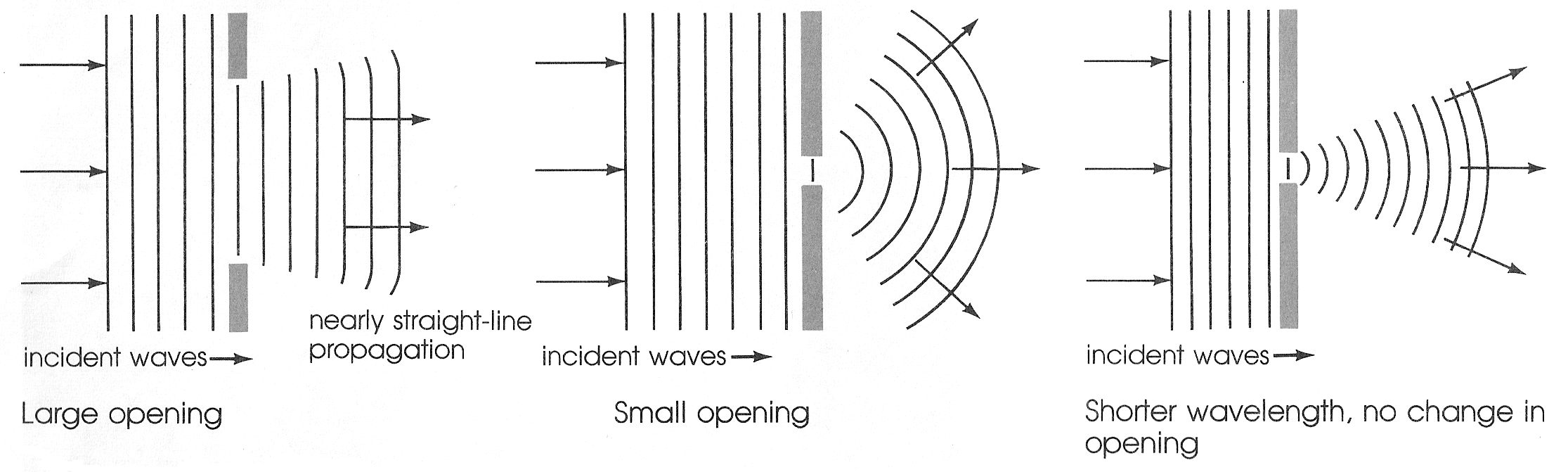
**Diffraction and Interference of Light**

Diffraction is

Diffraction is an ***edge effect***. Any time a wave hits the edge of an obstruction, it will appear to curl around the edge. When a wave hits a very large opening, the two edges are very far apart (see first picture). This means that the curling of the wave is not very strong. See how it mostly goes forward, with only a bit of curl at the edges. When the opening is made smaller, the edges are close, making the curling effect more apparent. Making the waves smaller (in length) is equivalent to making the opening bigger: the wave bends less.



(Diagram copied from: Martindale, D. et al. (1986). Fundamentals of physics: a senior course. Toronto: Heath.)

Long wavelength waves bend more than short wavelength waves. Consider sound waves: when a car playing a loud sound system drives by, the bass is heard first. This is because the bass notes are long wavelength. They can pass through small openings in the car and spread out into the air. The high frequency sound, like the guitar or snare drum, doesn’t bend as much, so you have to be directly in its path to hear it.

Summary:

A wave spreads around obstacles in its path. A wave can pass through an opening and then spread out radially from there.

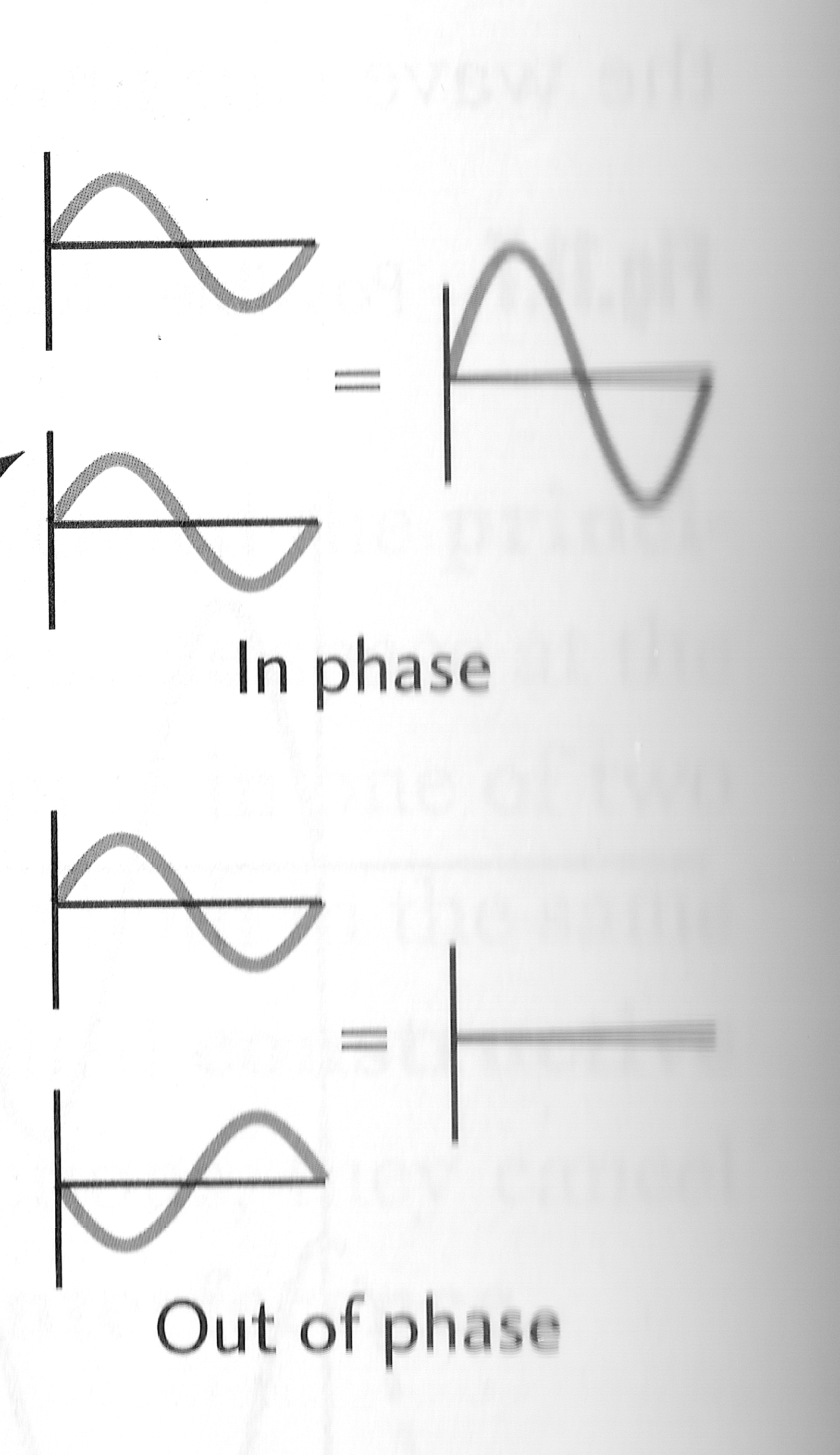
A wave will spread out more if the opening is smaller.

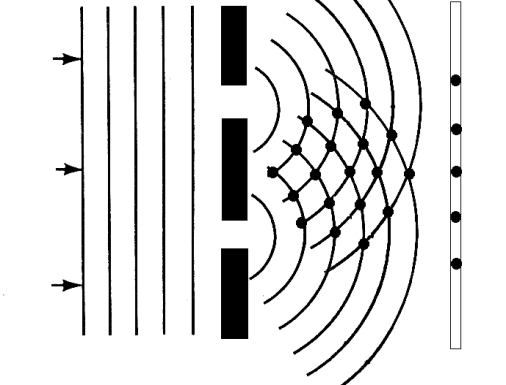
A wave will spread out more if the wavelength is longer.

**Interference**

Two small openings, placed near each other, can behave like two point sources and produce an interference pattern. In the picture below, we see a single wave moving through two openings. As the wave passes through each opening, it spreads out (this is called diffraction). The two diffracting wave patterns overlap, interfering with each other. Dots indicate where crest meeting crest. When the waves reach a screen on the right, the dot indicates where constructive interference will occur. At these points, the waves will be the largest, going from double trough to double crest. In between these points, the waves will cancel, making very little movement.

screen





If light is a wave, then we should see it diffract (spread out) as it passes through an opening. We should also observe an interference pattern when light from two sources strike a screen. Many scientists tried to show these effects but failed. **Thomas Young** was the first to successfully demonstrate an interference pattern with light.